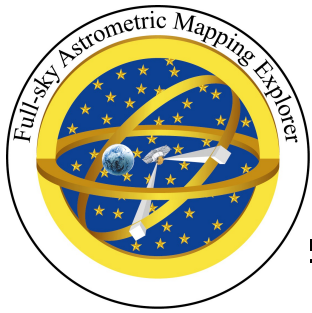


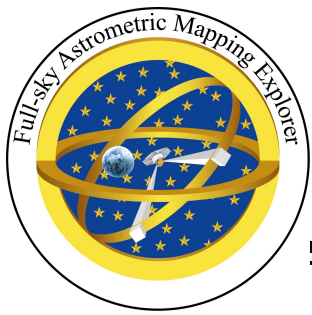
Design of FAME Star Catalog

25-April-01



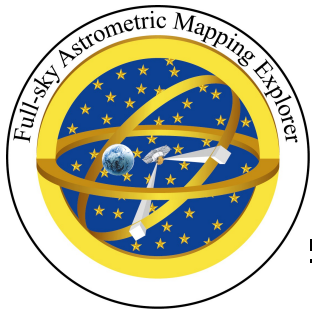
Outline

- **Introduction**
- **Requirements**
- **Structure**
- **Operations**
- **Catalog Size**



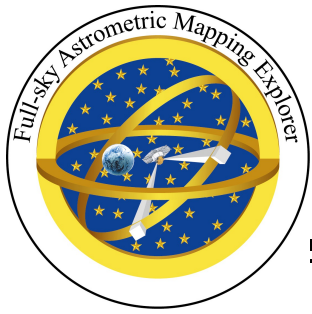
SW Requirements (1)

- The FAME Instrument SW shall provide a star catalog with storage for a maximum of 40,000,000 stars and special objects.
- The FAME Instrument SW shall provide a method for update of individual stars by ground command.
- The FAME Instrument SW shall provide a method to dump the contents of the star catalog to the ground.
- The FAME Instrument SW shall provide a method to add temporary special objects (e.g. asteroids) to the star catalog.



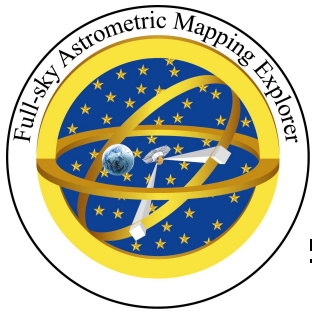
SW Requirements (2)

- The FAME Instrument SW shall provide the following data items in the star catalog:
 - Star Number
 - Star position
 - Window Type
 - Magnitude
 - Gain Setting
 - Processing Flags
 - ◆ Acquisition Star
 - ◆ Guide Star
 - Collection Sequence



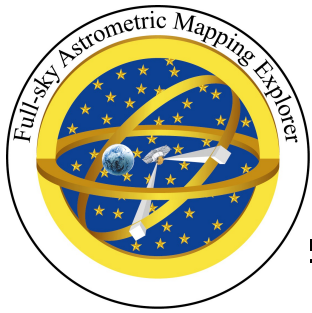
SW Requirements (3)

- The FAME Instrument SW shall allow for partial flash memory failure.

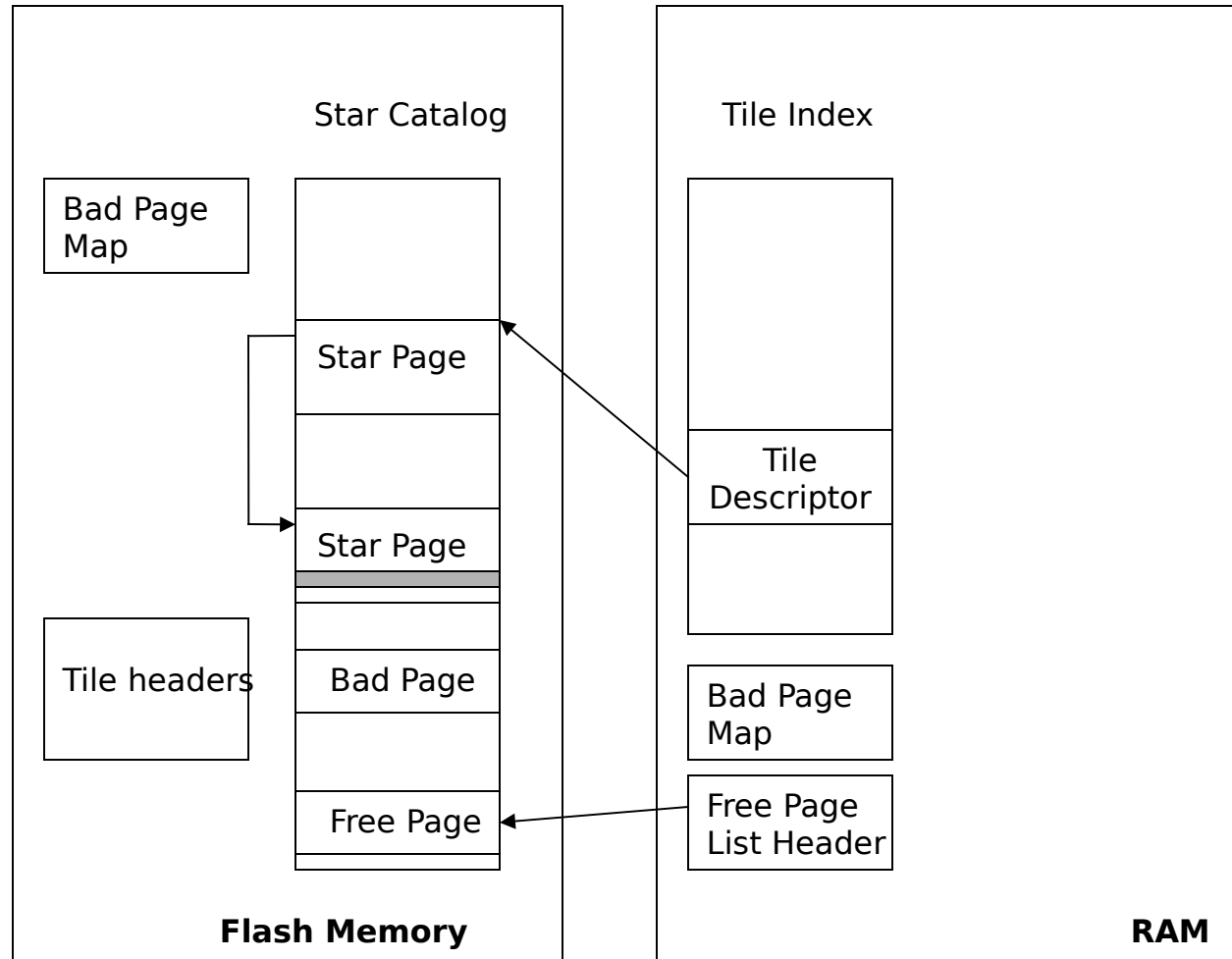


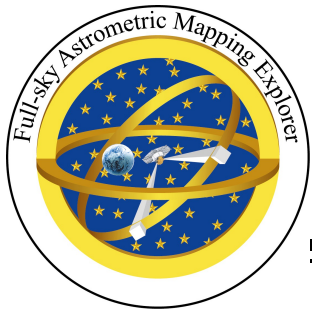
Catalog Organization

- **Star Catalog**
 - ▢ 40,000,000 stars
 - ▢ 40,000 tiles of approximate 1,000 stars each
 - ▢ Approximately $1^\circ \times 1^\circ$ (RA, Dec)
 - ▢ Segmented into pages
- **Tile Descriptor**
 - ▢ 40,000 descriptors
 - ▢ Pointer to pages



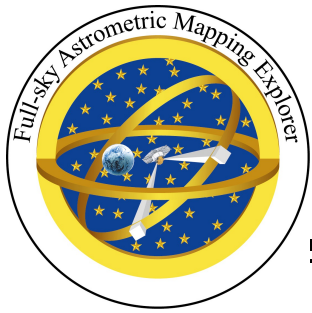
Data Levels





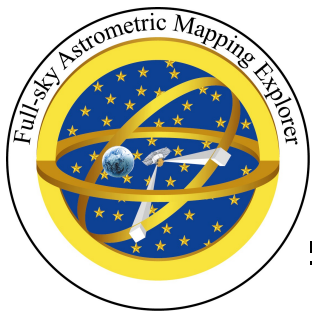
Star Entries

- **Data**
 - ▢ **Star ID**
 - ▢ **Direction vector**
 - ▢ **Processing flags (acquisition, guide, science)**
 - ▢ **Magnitude**
 - ▢ **Collection Sequence**
 - ▢ **Window Type**
 - ▢ **Gain**
- **Storage**
 - ▢ **Entries in flash memory**
 - ▢ **Updates in RAM**



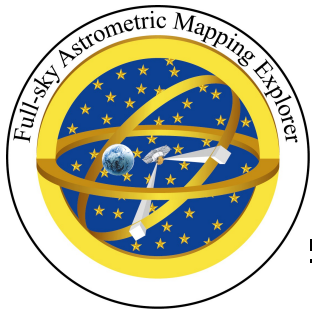
Star Catalog Page

- **Data**
 - **Next page (or null)**
 - **Number of entries**
 - **Tile Number**
 - **Checksum**
 - **Star Records**
- **Storage**
 - **Flash Memory**
- **Description**
 - **Used to hold star entries for each tile**



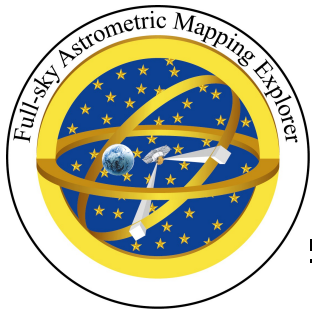
Tile Descriptors

- **Data**
 - **First page pointer**
 - **Number of stars**
 - **Center direction vector**
- **Storage**
 - **RAM**
- **Description**
 - **Used to access stars**
 - **Rebuilt from flash memory pages on reboot**



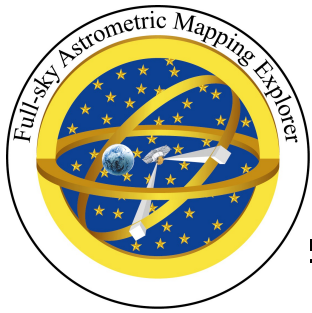
Bad Page Map

- **Data**
 - Bit map of bad pages
 - 40,000 pages requires 5,000 bytes
- **Storage**
 - Flash Memory
 - RAM
- **Description**
 - Copied to RAM on Reboot
 - Updated based memory verification
 - Written to flash memory



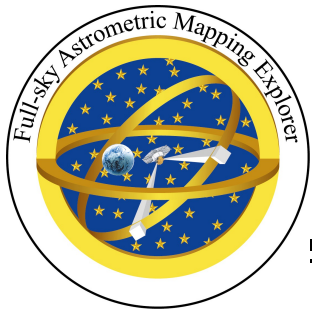
Free Page List

- **Data**
 - List of free pages
- **Storage**
 - RAM
- **Description**
 - Build on reboot
 - Used to update catalog



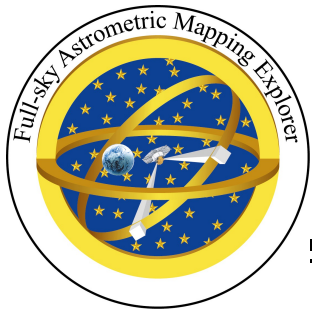
Catalog Operations

- **Catalog operations**
 - **get_info**
 - **init_catalog**
 - **update_star**
 - **add_star**
 - **delete_star**
 - **get_star**
 - **get_stars**
 - **compress**
 - **verify**



Flash Memory Sizing

		Bytes	
	Star Number	4	
	Direction Vector	12	Integer, Three dimension, 32 bits per dimension
	Processing Flags	1	Star type: Acquisition, Guide, Science
	Window Type	1	
	Magnitude	1	
	Gain	1	
	Collection Seq	1	
Total Item		21	
Total Array		840,000,000	
Constants			
Number of Stars	40,000,000		



Summary

- **Two level organization of star catalog**
- **Memory requirements**
 - **Flash Memory 840 MB**
 - **RAM 2 MB**